

## Power Triode

### GENERAL DATA

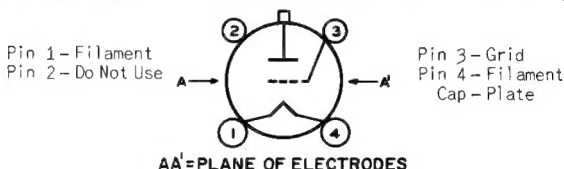
#### Electrical:

Filament, Thoriated Tungsten:

Voltage (AC or DC) . . . . .	6.3	volts
Current . . . . .	4	amp
Amplification Factor . . . . .	160	
Direct Interelectrode Capacitances (Approx.):		
Grid to plate . . . . .	5.6	pf
Grid to filament . . . . .	5.9	pf
Plate to filament . . . . .	0.7	pf

#### Mechanical:

Operating Position. . . . .	Vertical, base down; or Horizontal, pins 1 & 4 in vertical plane
Maximum Overall Length. . . . .	6-15/32"
Seated Length . . . . .	5-11/16" ± 5/32"
Maximum Diameter. . . . .	2-7/16"
Weight. . . . .	2.7 oz
Bulb. . . . .	ST19
Cap. . . . .	Medium (JEDEC No. C1-5)
Base. . . . .	Medium-Shell Small 4-Pin Micanol with Bayonet (JEDEC No. A4-10)
Basing Designation for BOTTOM VIEW. . . . .	3G



### AF POWER AMPLIFIER & MODULATOR — Class B

Maximum Ratings, Absolute-Maximum Values:

	CCS <sup>a</sup>	ICAS <sup>b</sup>	
DC PLATE VOLTAGE. . . . .	1250 max.	1500 max.	volts
MAX.—SIGNAL DC PLATE CURRENT . . . . .	175 max.	175 max.	ma
MAX.—SIGNAL PLATE INPUT . . . . .	165 max.	235 max.	watts
PLATE DISSIPATION <sup>c</sup> . . . . .	45 max.	65 max.	watts

#### Typical Operation:

Values are for two tubes<sup>d</sup>

DC Plate Voltage. . . . .	750	1250	1000	1250	1500	volts
DC Grid Voltage <sup>e</sup> . . . . .	0	0	0	0	-4.5	volts
Peak AF Grid-to-Grid Voltage . . . . .	197	145	185	175	170	volts
Zero-Signal DC Plate Current . . . . .	32	50	44	54	32	ma

← Indicates a change.



	CCS		ICAS				
Max.—Signal DC Plate Current . . . . .	350	260	350	350	313		ma
Effective Load Resistance (Plate to plate). . . . .	5100	12400	7400	9200	12400		ohms
Max.—Signal Driving Power (Approx.) . .	9.7	3.8	7.5	6.0	4.4		watts
Max.—Signal Power Output (Approx.) . .	178	235	248	310	340		watts

## PLATE-MODULATED RF POWER AMPLIFIER — Class C Telephony

*Carrier conditions per tube for use  
with a maximum modulation factor of 1*

### Maximum Ratings, Absolute-Maximum Values:

	CCS	ICAS	
DC PLATE VOLTAGE. . . . .	1000 max.	1250 max.	volts
DC GRID VOLTAGE . . . . .	-200 max.	-200 max.	volts
DC PLATE CURRENT. . . . .	125 max.	150 max.	ma
DC GRID CURRENT . . . . .	50 max.	50 max.	ma
PLATE INPUT . . . . .	115 max.	175 max.	watts
PLATE DISSIPATION . . . . .	30 max.	45 max.	watts

### Typical Operation:

DC Plate Voltage. . . . .	1000	1250	volts
DC Grid Voltage: <sup>f</sup>			
From a grid resistor of:			
1200 ohms . . . . .	-55	—	volts
2700 ohms . . . . .	—	-120	volts
Peak RF Grid Voltage. . . . .	150	250	volts
DC Plate Current. . . . .	115	140	ma
DC Grid Current (Approx.) <sup>g</sup> . .	45	45	ma
Driving Power (Approx.) <sup>g</sup> . . .	6.1	10	watts
Power Output (Approx.) . . . .	88	135	watts

## RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy<sup>h</sup>

### Maximum Ratings, Absolute-Maximum Values:

	CCS	ICAS	
DC PLATE VOLTAGE. . . . .	1250 max.	1500 max.	volts
DC GRID VOLTAGE . . . . .	-200 max.	-200 max.	volts
DC PLATE CURRENT. . . . .	175 max.	175 max.	ma
DC GRID CURRENT . . . . .	50 max.	50 max.	ma
PLATE INPUT . . . . .	175 max.	260 max.	watts
PLATE DISSIPATION . . . . .	45 max.	65 max.	watts

### Typical Operation:

DC Plate Voltage. . . . .	1250	1500	volts
DC Grid Voltage: <sup>j</sup>			
From a grid resistor of:			
1100 ohms . . . . .	-50	—	volts
1750 ohms . . . . .	—	-70	volts

From a cathode resistor of:			
270 ohms. . . . .	-50	-	volts
330 ohms. . . . .	-	-70	volts
Peak RF Grid Voltage. . . . .	140	175	volts
DC Plate Current. . . . .	140	173	ma
DC Grid Current (Approx.) <sup>g</sup> . . . . .	45	40	ma
Driving Power (Approx.) <sup>g</sup> . . . . .	5.7	7.1	watts
Power Output (Approx.) . . . . .	135	200	watts

### SELF-RECTIFYING AMPLIFIER<sup>k</sup> — Class C

#### Maximum CCS Ratings, Absolute-Maximum Values:

AC PLATE VOLTAGE (RMS). . . . .	1750 max.	volts
DC GRID VOLTAGE . . . . .	-125 max.	volts
DC PLATE CURRENT. . . . .	65 max.	ma
DC GRID CURRENT . . . . .	25 max.	ma
PLATE INPUT . . . . .	125 max.	watts
PLATE DISSIPATION . . . . .	45 max.	watts

#### Typical Operation in Push-Pull Circuit at 27 Mc:

*Values are for 2 tubes*

AC Plate Voltage (RMS). . . . .	1750	volts
DC Grid Voltage: <sup>f, m</sup>		
From a grid resistor of:		
1500 ohms . . . . .	-70	volts
DC Plate Current. . . . .	130	ma
DC Grid Current (Approx.) . . . . .	46	ma
Driving Power (Approx.) <sup>n</sup> . . . . .	12	watts
Power Output (Approx.) . . . . .	175	watts
Useful Power Output (Approx.)—		
75% circuit efficiency. . . . .	130	watts

### AMPLIFIER<sup>k</sup> — Class C

*With Separate, Rectified, Unfiltered,  
Single-Phase, Full-Wave Plate Supply*

#### Maximum CCS Ratings, Absolute-Maximum Values:

DC PLATE VOLTAGE. . . . .	1125 max.	volts
DC GRID VOLTAGE . . . . .	-125 max.	volts
DC PLATE CURRENT. . . . .	160 max.	ma
DC GRID CURRENT . . . . .	45 max.	ma
PLATE INPUT . . . . .	175 max.	watts
PLATE DISSIPATION . . . . .	45 max.	watts

#### Typical Operation:

DC Plate Voltage. . . . .	1125	volts
DC Grid Voltage: <sup>f, m</sup>		
From a grid resistor of:		
1400 ohms . . . . .	-35	volts
DC Plate Current. . . . .	125	ma
DC Grid Current (Approx.) . . . . .	25	ma
Driving Power (Approx.) <sup>k</sup> . . . . .	3	watts
Power Output (Approx.) . . . . .	135	watts



**LINEAR RF POWER AMPLIFIER — Class AB<sub>2</sub>***Single-Sideband Suppressed-Carrier Service***Maximum Ratings, Absolute-Maximum Values up to 30 Mc:**

	CCS	ICAS	
DC PLATE VOLTAGE. . . . .	1250 max.	1500 max.	volts
DC PLATE CURRENT:			
Max.—Signal (Single-Tone) or			
Peak-Envelope (Two-Tone). . . . .	175 max.	175 max.	ma
DC GRID CURRENT . . . . .	50 max.	50 max.	ma
DC PLATE INPUT:			
Max.—Signal (Single-Tone) or			
Peak-Envelope (Two-Tone). . . . .	165 max.	235 max.	watts
PLATE DISSIPATION . . . . .	45 max.	65 max.	watts

**Typical Operation with "Single-Tone" Modulation:<sup>a</sup>**

DC Plate Voltage. . . . .	1250	1500	volts
DC Grid Voltage <sup>r</sup> . . . . .	0	-4.5	volts
Zero-Signal DC Plate Current. . . . .	25	16	ma
Effective RF Load Resistance. . . . .	5700	6000	ohms
DC Plate Current. . . . .	130	157	ma
DC Grid Current . . . . .	30	30	ma
Peak RF Grid Voltage. . . . .	78	88	volts
Driver Power Output, (Approx.) <sup>s</sup> . . . . .	7	8	watts
Output-Circuit Efficiency (Approx.). . . . .	90	90	%
Useful Max.—Signal Power Output			
(Approx.) . . . . .	120 <sup>t</sup>	160 <sup>t</sup>	watts

**Typical Operation with "Two-Tone" Modulation at 30 Mc:<sup>u</sup>**

DC Plate Voltage. . . . .	1250	1500	volts
DC Grid Voltage <sup>r</sup> . . . . .	0	-4.5	volts
Zero-Signal DC Plate Current. . . . .	25	16	ma
Effective RF Load Resistance. . . . .	5700	6000	ohms
DC Plate Current:			
Peak-Envelope . . . . .	130	157	ma
Average . . . . .	91	110	ma
Average DC Grid Current . . . . .	20	20	ma
Peak-Envelope Driver Power Output			
(Approx.) <sup>s</sup> . . . . .	7	8	watts
Output-Circuit Efficiency (Approx.). . . . .	90	90	%
Distortion Products Level: <sup>v</sup>			
Third order . . . . .	-26	-25	db
Fifth order . . . . .	-32	-30	db
Useful Power Output (Approx.):			
Peak-Envelope . . . . .	120 <sup>t</sup>	160 <sup>t</sup>	watts
Average . . . . .	60 <sup>t</sup>	80 <sup>t</sup>	watts

**CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN**

	Note	Min.	Max.	
Filament Current. . . . .	1	3.75	4.25	amp
Amplification Factor. . . . .	1,2	144	176	
Grid-Plate Capacitance. . . . .	—	4.9	6.3	pf
Grid-Filament Capacitance . . . . .	—	4.9	6.9	pf

→ Indicates a change.



Plate-Filament Capacitance. . . . .	-	0.52	0.88	pf
Plate Current . . . . .	1,3	16	36	ma
Grid Current. . . . .	1,4	25	85	ma
Useful Power Output . . . . .	1,5	160	-	watts ←

Note 1: With dc filament voltage of 6.3 volts.

Note 2: With dc plate current of 20 ma. and dc grid voltage of -1 volt.

Note 3: With dc plate voltage of 2000 volts and dc grid voltage of -2 volts.

Note 4: With dc plate voltage of 200 volts and dc grid voltage of +50 volts.

Note 5: With dc plate voltage of 1500 volts; dc plate current of 175 ma; dc grid current of 34 to 50 ma; grid resistor of 3500 ± 10% ohms; and frequency of 15 Mc.

a Continuous Commercial Service.

b Intermittent Commercial and Amateur Service.

c Averaged over any audio-frequency cycle of sine-wave form.

d When two or more tubes are used precautions should be taken to balance the plate currents.

e For ac filament supply.

f Obtained by grid resistor of value shown or by partial self-bias methods.

g For effect of load resistance on grid current and driving power, refer to TUBE RATINGS—*Grid Current and Driving Power* in the General Section.

h Key-down conditions per tube without modulation. Modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115 per cent of the carrier conditions.

j Obtained from fixed supply, by grid resistor, by cathode resistor, or by combination methods.

k The 811A is not recommended for oscillator service in applications involving wide variations in load. For such applications, the 812A with its low amplification factor is preferred because of its ability to oscillate over a wide range of load variation.

m The 811A can be biased by any convenient method. However, the use of a grid resistor is preferred because the bias is automatically adjusted as the load on the circuit varies. In those applications, such as are encountered in therapeutic equipment, where grid current and grid voltage may vary widely because of fluctuating loads, it is important to design equipment so that the maximum grid-current and grid-voltage ratings are never exceeded for any load.

n From a self-rectifying driver.

p From a driver with a rectified, unfiltered, single-phase, full-wave plate supply.

q "Single-Tone" operation refers to that class of amplifier service in which the input consists of a monofrequency rf signal having constant amplitude. This signal is produced in a single-sideband suppressed-carrier system when a single audio frequency of constant amplitude is applied to the input of the system.

r Obtained preferably from a separate, well-regulated supply.

s Driver power output represents circuit losses and is the actual power measured at input to the grid circuit. The actual power required depends on the operating frequency and the circuit used.

t This value of useful power is measured at load of output circuit having indicated efficiency.

u "Two-Tone Modulation" operation refers to that class of amplifier service in which the input consists of two equal monofrequency rf signals having constant amplitude. These signals are produced in a single-sideband suppressed-carrier system when two equal-and-constant amplitude audio frequencies are applied to the input of the system.

v Referenced to either of the two tones and without the use of feedback to enhance linearity.

## OPERATING CONSIDERATIONS

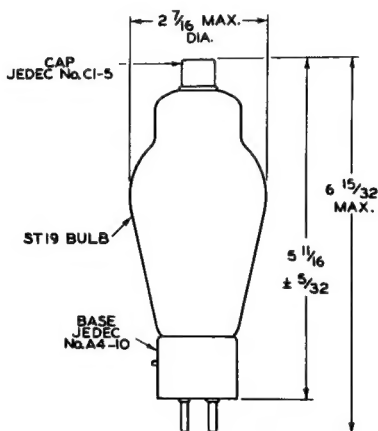
Plate shows no color when tube is operated at maximum CCS ratings, and shows a barely perceptible red color at maximum ICAS ratings.

← Indicates a change.



## MAXIMUM RATINGS vs OPERATING FREQUENCY

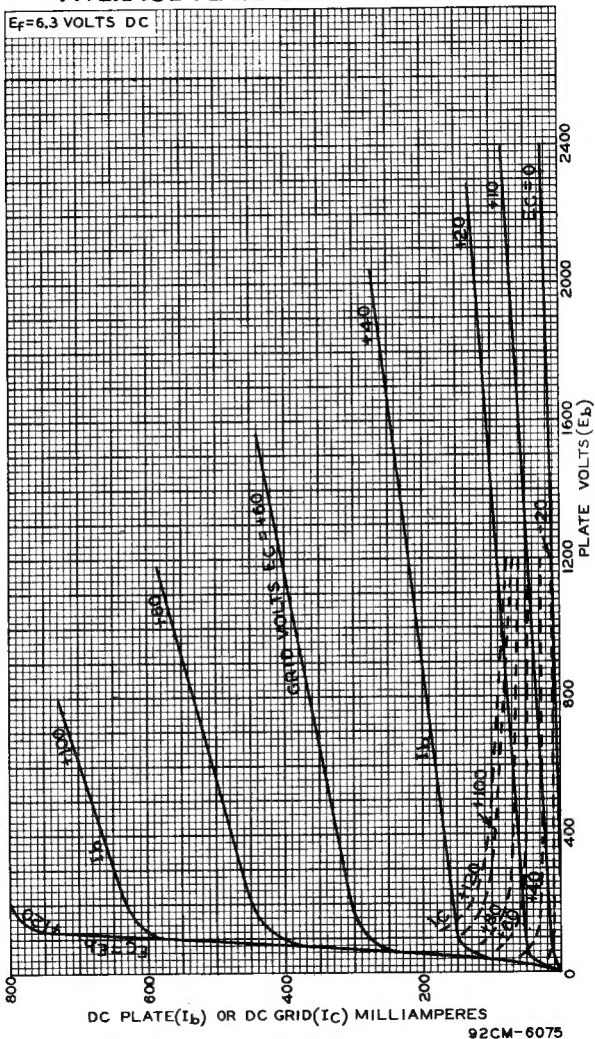
OPERATING FREQUENCY Mc	MAXIMUM PERMISSIBLE PERCENTAGE OF MAXIMUM PLATE VOLTAGE & PLATE INPUT	
	TELEPHONY	TELEGRAPHY
	Class C Plate- Modulated	Class C
30	100	100
60	89	89
80	70	70
100	55	55



92CS-6905R2

ALL DIMENSIONS IN INCHES

## AVERAGE PLATE CHARACTERISTICS

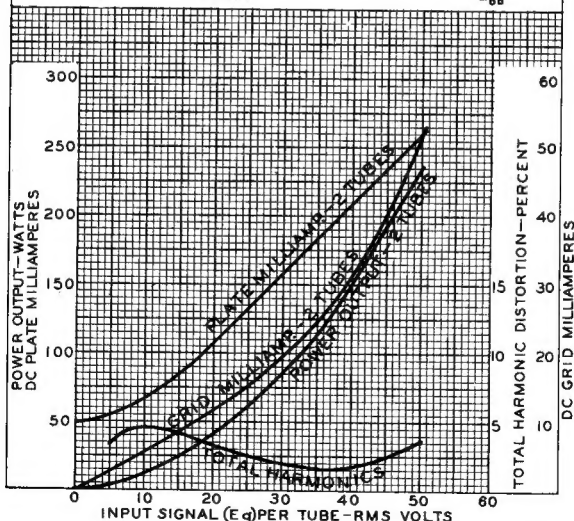
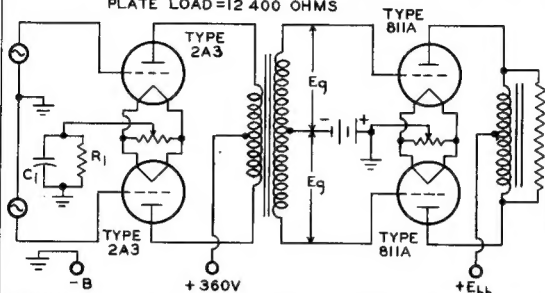


## OPERATION CHARACTERISTICS

$E_f = 6.3$  VOLTS AC FOR 811A's & 2.5 VOLTS AC FOR 2A3's  
 INPUT: CLASS AB<sub>1</sub>-TWO TYPE 2A3's; PLATE-SUPPLY VOLTS = 360; CATHODE-BIAS RESISTOR ( $R_1$ ) = 780 OHMS; BYPASS CAPACITOR ( $C_1$ ) = 80  $\mu$ F

INTERSTAGE TRANSFORMER (T):  
 VOLTAGE RATIO  $\frac{\text{PRIMARY}}{\frac{1}{2} \text{ SEC.}} = 6$

OUTPUT: CLASS B-TWO TYPE 811A's; PLATE-SUPPLY VOLTS ( $E_{bb}$ ) = 1250; DC GRID VOLTS = 0; PLATE-TO-PLATE LOAD = 12 400 OHMS



92CM-7138



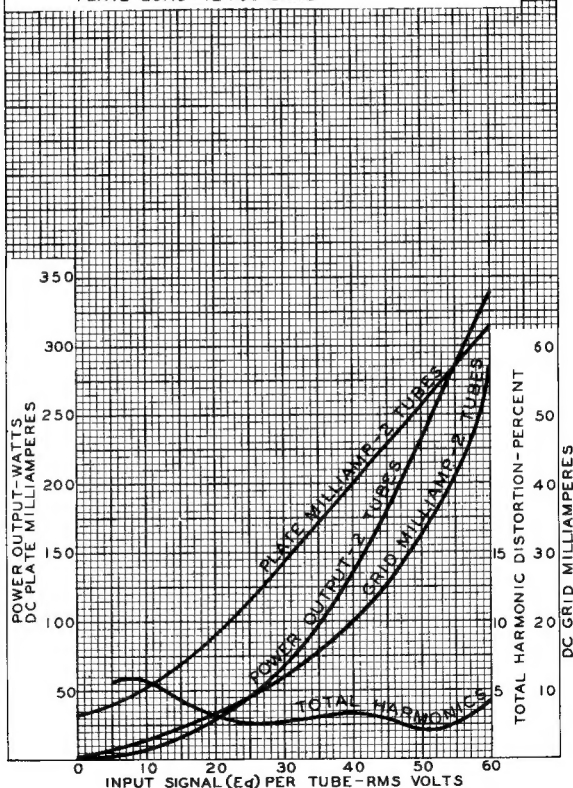
## OPERATION CHARACTERISTICS

$E_g = 6.3$  VOLTS AC FOR 811A's & 2.5 VOLTS AC FOR 2A3's  
CIRCUIT ARRANGEMENT: SAME AS ON DWG. 92CM-7138  
UNDER TYPE 811A

INPUT: CLASS AB1-TWO TYPE 2A3's; PLATE-SUPPLY  
VOLTS = 360; CATHODE-BIAS RESISTOR ( $R_1$ ) = 780  
OHMS; BYPASS CAPACITOR ( $C_1$ ) = 80  $\mu$ F

INTERSTAGE TRANSFORMER (T):  
VOLTAGE RATIO  $\frac{\text{PRIMARY}}{\frac{1}{2} \text{ SEC.}} = 6$

OUTPUT: CLASS B-TWO TYPE 811A's; PLATE-SUPPLY VOLTS  
( $E_{bb}$ ) = 1500; DC GRID VOLTS = -4.5; PLATE-TO-  
PLATE LOAD = 12400 OHMS



92CM-7139

